PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Hideyuki NAKAMURA

Docket No: Q78725

Appln. No.: 10/724,183

Group Art Unit: 1752

Confirmation No.: 1328

Examiner: Richard L. Schilling

Filed: December 1, 2003

For: HEAT TRANSFER SHEET, HEAT TRANSFER RECORDING MATERIAL, AND METHOD FOR IMAGE FORMATION

DECLARATION UNDER 37 C.F.R. § 1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Hideyuki NAKAMURA, hereby declare and state:

THAT I am a citizen of Japan;

THAT I am the named inventor of the above-identified present application;

THAT I graduated from graduate school of Tokyo University of Science, Faculty of Science, Course of chemistry in March 1989;

THAT I have been employed since April 1989 by Fuji Photo Film Co., Ltd., and have been engaged in research and development for proof printing at the Fujinomiya Factory Research division of the company.

THAT I have conducted the following experiment to show that the present invention achieves unexpected results as the result of the use of polyamide-imide binder as compared to the use of a polyimide binder in the light-heat conversion layer of a thermal transfer sheet.

In particular, in New Invention Examples 2 and 3 and in an Additional Comparative Example, I duplicated Invention Example 1 of the present application, except that instead of the

polyamide-imide resin employed in Invention Example 1 as a binder in the light-heat conversion layer, I employed in New Invention Examples 2 and 3 different polyamide-imide resins, and in the Additional Comparative Example I employed a polyimide resin SN-20F, available from New Japan Chemical Co., Ltd. The polyamide-imide resins that were employed in Invention Example 1 and New Invention Examples 2 and 3 were Vylomax HR11NN, HR16NN and HR12N2, respectively, available from Toyobo Co., Ltd. I subjected the so-prepared heat transfer sheets to testing in the same manner as Example 1.

I attach hereto a Catalog (1) which discloses the properties of the SN-20F polyimide resin employed in the Additional Comparative Example, and a printout (2 pages) from the Toyobo Co. website which discloses the properties of the Vylomax HR11NN, HR16NN and HR12N2 polyamide-imide resins employed in Invention Example 1 and New Invention Examples 2 and 3, respectively.

The results are shown in the following Table.

	Binder in LH Layer*		Color	OD (808nm)	Dye	Water Content of Dye (%)	Amount of Dye in LH Layer* (g/m^2)	Sensitivity (mJ/m^2)
	Binder	Tg(°C)						
Invention Example 1	PAI 1 (*1)	300	black	1.15	A	6.0	0.08	150
New Invention Example 2	PAI 2 (*2)	~~325~~ 320	black	1.15	A	6.0	0.09	150
New Invention Example 3	PAI 3 (*3)	255	black	1.15	A	6.0	0.10	180
Additional Comp. Example	PI (*4)	295	black	1.15	A	6.0	0.10	200

H.N. 24/03/0

* Light-heat conversion layer
(*1) Polyamide-imide resin (HR11NN, available from Toyobo Co., Ltd.)
(*2) Polyamide-imide resin (HR16NN, available from Toyobo Co., Ltd.)
(*3) Polyamide-imide resin (HR12N2, available from Toyobo Co., Ltd.)
(*4) Polyamide resin (SN-20F, available from New Japan Chemical Co., Ltd.)

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As can be seen from the above Table, the sensitivity results for Examples 1 to and 3, in which polyamide-imide resins were used, were improved and unexpected as compared to the sensitivity result for the Additional Comparative Example in which a polyimide resin was used.

I note that a lower sensitivity value represents an improved and higher sensitivity because the sensitivity is obtained from the equation:

$$\text{Sensitivity (mJ/cm}^2\text{)} = \frac{\text{(laser power)}}{\text{(d x drum rotational speed)}}$$

disclosed at page 93 of the specification. In this equation, the variable "d" represents the recorded line width, with a larger recorded line width "d" indicating higher transfer sensitivity. Since "d" is in the denominator of the equation, lower sensitivity values indicate higher transfer sensitivity.

I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: 24/03/05

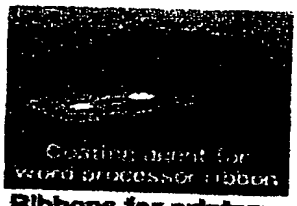
Hideyuki Nakamura
Hideyuki NAKAMURA

Toyobo heat resistant polymer

VYLOMAX®

What is polyamide-imide? | What is Vylomax® ? | What are their properties?

Contact us



Ribbons for printers
(VYLOMAX® is used as the heat resistant backcoat)

VYLOMAX® is a heat resistant polymer developed by Toyobo's advanced technology. It contains both imide bonding and amide bonding in each one molecule and provides excellent heat resistance and chemical resistance.

List of VYLOMAX®

1. Characteristics of the solution

Grade	Appearance	Solid content (%)	Solution viscosity (dPa·s/25℃)	Solvent composition (Weight ratio)	Features
HR11NN	Yellowish brown	15	20	NMP=100	Toughness
HR12N2	Yellowish brown	30	5	NMP/XYL/MEK=50/35/15	Flexibility
HR13NX	Yellowish brown	30	85	NMP/XYL=67/33	Friction/wear resistance
HR14ET	Light yellow	25	10	EtOH/TOL=50/50	Low dynamic friction, transparency
HR15ET	Light yellow	25	10	EtOH/TOL=50/50	Colorless, transparency
HR16NN	Yellowish brown	15	500	NMP=100	High modulus, low thermal expansion

2. Characteristics of the resin

Grade	Molecule weight ($\times 10^3$)	Tg (℃)	Breaking strength MPa	Breaking elongation (%)	Coefficient of thermal expansion ($\times 10^{-5}$/℃)	Light transmission factor (%;500nm)
HR11NN	15	300	150	80	4.2	72
HR12N2	8	255	85	<10	5.0	73
HR13NX	10	280	105	20	4.2	72
HR14ET	10	250	95	24	5.9	88
HR15ET	10	260	100	20	5.7	88
HR16NN	30	320	420	60	2.3	64

Before using the listed products, please carefully check that the selected product meets the requirements of your applications, purposes of use, processing conditions, etc.
Data listed are given only for reference and do not represent the guarantee values.

(1)

2．リカコートより得られるポリイミド樹脂の基本特性

リカコートから脱溶剤して得られるポリイミドフィルムは、ポリイミド特有の優れた耐熱性はもちろん、優れた機械特性、電気特性及び耐薬品性を有します。高温下でのスパッタリング等の工程にも耐え、また、熱可塑性であるため、Tg以上の温度でフィルムの圧着、融着も可能です。さらに、200℃以上における長期連続使用も可能です。フィルムの代表的な諸特性（表3、図5）及び長期耐熱性試験結果（図6）を以下に示します。

表3　リカコートより形成されるポリイミドフィルムの諸特性

［フィルム作製条件：リカコートをガラス板上にキャスト後、減圧下、300℃で脱溶剤（膜厚45μm）］

<熱的性質>

項　目	SN−20	PN−20	測定法
ガラス転移温度（℃）	295	265	DSC
5wt%重量減少温度（℃）	515	490	TGA，窒素下
線膨張係数（$\times 10^{-5}$cm/cm/℃）	5.3	5.3	TMA，100～200℃
ハンダ耐熱性	外観変化なし	外観変化なし	260℃，5分間浸漬
難燃性	V−0相当	V−0相当	

<機械的性質>

項　目	SN−20	PN−20	測定法
引張り強度（kg/mm²）	11.8	11.2	JIS K7127
伸び（%）	4.2	20.4	JIS K7127
弾性率（kg/mm²）	274	253	JIS K7127

<電気的性質>

項　目	SN−20	PN−20	測定法
絶縁破壊強さ（kV/mm）	172	141	短時間法（空気下）
誘電率［1kHz］　25℃ 200℃	3.1 2.8	3.3 2.9	ASTM D 150
誘電正接［1kHz］　25℃ 200℃	0.004 0.007	0.003 0.008	ASTM D 150
体積抵抗率（Ωcm）［500V］	10^{16}	10^{16}	ASTM D 257
表面抵抗率（Ω）［500V］	10^{16}	10^{16}	ASTM D 257

<物理的性質>

項　目	SN−20	PN−20	測定法
吸水率（%）　RH 80% 24時間浸漬	0.4 2.2	0.6 2.3	ASTM D 570